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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/726,533	12/01/2000	Mari Matsunaga	200309US2	1126
22850	7590	07/19/2005	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			DEPPE, BETSY LEE	
			ART UNIT	PAPER NUMBER
			2637	

DATE MAILED: 07/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/726,533

Applicant(s)

MATSUNAGA ET AL.

Examiner

Betsy L. Deppe

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE three MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 May 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action is in response to the amendment filed May 11, 2005.

Claim Objections

2. Claims 2, 4 and 6 objected to because of the following informalities:
in claim 2, line 2, "ata" should be "data" to correct a typographical error; and
in line 4 of claims 2, 4 and 6, "the" should be inserted before "hard". Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
4. Claims 1, 2, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art in Figure 10 of the present application in view of Blasiak et al. (US Patent No. 5,706,313 cited in the Office Action mailed March 3, 2004, Paper No. 3), Herzberg (US Patent No. 5,996,104 cited in the Office Action mailed February 14, 2005) and Watanabe et al. (US Patent No. 6,301,684).
5. With regard to claims 1 and 7, Figure 10 in the present application discloses the claimed invention except for decoding based on the soft decision demodulated data wherein the soft decision demodulated data is estimated as a product of hard decision

data and reliability information that is calculated as recited. (See page 3, line 11 – page 7, line 22)

Figure 2 of Blasiak et al. discloses using a soft decision demodulated data estimating unit (201) and a decoding unit for decoding based on the soft decision demodulated data in a differential phase shift keying demodulator. (See column 3, line 18 - column 5, line 55) It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a soft decision demodulated data estimating unit (as disclosed by Blasiak et al.) instead of the hard decision estimating unit in the admitted prior art of Figure 10 in order to improve the bit error rate performance of the demodulator. (See Blasiak et al. column 2, lines 52-58)

Herzberg discloses generating a soft decision equal to the product of a reliability data and hard decision data. (See column 7, lines 22-26) It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the soft decision demodulated data estimating unit by multiplying the hard decision provided by the Viterbi Sequence Estimation Unit (530) in Figure 10 with reliability information in order to have a simple soft decision demodulated data estimating unit that requires minimal calculations. Using minimal calculations for generating soft decision data minimizes the overall circuit size and power requirements.

Watanabe et al. teaches calculating reliability information ("reliability data CF") by subtracting (see equation (2)) a likelihood ("PS(y)") for a first survival path metric having a first state ("00101" in Figure 4) on the trellis diagram from a likelihood ("PS(x)") for a second survival path metric having a second state ("00100" in Figure 4). (See also

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column 3, lines 38-44, column 7, lines 38-48 and column 7, line 66-column 8, line 4) It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reliability information calculation as disclosed by Watanabe et al. in the circuit disclosed by the admitted prior art in view of Blasiak et al. and Herzberg in order to more accurately determine the likelihood of the data.

6. With regard to claim 2, the description corresponding to the admitted prior art in Figure 2 discloses that the bit corresponding to the differential phase of a first state having a minimum survival path metric is the hard decision data. (See page 7, lines 12-20). Although Watanabe et al. does not explicitly define each survival path metric as recited in claim 2, lines 5-8, it is implicit/inherent that the process of Viterbi decoding involves the selection of a survival path and the corresponding path metric while discarding the less likely paths. Therefore, the admitted prior art in view of Blasiak et al., Herzberg and Watanabe et al. disclose the claimed invention.

7. Claims 3-6, 9, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art in Figure 10 of the present application in view of Blasiak et al., Herzberg, Watanabe and Nagayasu et al. (US Patent No. 6,269,124 B1 cited in the Office Action mailed March 3, 2004, Paper No. 3).

8. With regard to claims 3, 5, 9, and 11, Figure 10 in the present application discloses the claimed invention except for a soft decision demodulated data estimating unit that estimates soft decision demodulated data based on a survival path metric, a

power detection unit, a p-multiplying unit, and a decoding unit for decoding based on the soft decision demodulated data. (See page 3, line 11 – page 7, line 22)

Figure 2 of Blasiak et al. discloses using a soft decision demodulated data estimating unit (201) and a decoding unit for decoding based on the soft decision demodulated data in a differential phase shift keying demodulator. (See column 3, line 18 - column 5, line 55) It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a soft decision demodulated data estimating unit (as disclosed by Blasiak et al.) instead of the hard decision estimating unit in the admitted prior art of Figure 10 in order to improve the bit error rate performance of the demodulator. (See Blasiak et al. column 2, lines 52-58)

Herzberg discloses generating a soft decision equal to the product of a reliability data and hard decision data. (See column 7, lines 22-26) It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the soft decision demodulated data estimating unit by multiplying the hard decision provided by the Viterbi Sequence Estimation Unit (530) in Figure 10 with reliability information in order to have a simple soft decision demodulated data estimating unit that requires minimal calculations. Using minimal calculations for generating soft decision data minimizes the overall circuit size and power requirements.

Watanabe et al. teaches calculating reliability information ("reliability data CF") by subtracting (see equation (2)) a likelihood ("PS(y)") for a first survival path metric having a first state ("00101" in Figure 4) on the trellis diagram from a likelihood ("PS(x)") for a second survival path metric having a second state ("00100" in Figure 4). (See also

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column 3, lines 38-44, column 7, lines 38-48 and column 7, line 66-column 8, line 4) It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reliability information calculation as disclosed by Watanabe et al. in the circuit disclosed by the admitted prior art in view of Blasiak et al. and Herzberg in order to more accurately determine the likelihood of the data.

However, the admitted prior art in Figure 10 of the present invention in view of Blasiak et al., Herzberg and Watanabe et al. does not disclose a power detection unit and a p-multiplying unit wherein the results of these units are used by the soft decision demodulated data estimating unit. Figures 4 and 7 of Nagayasu et al. teaches using a power detection unit and a p-multiplying unit wherein the results of these units are used by the soft decision demodulated data estimating unit. (See column 7, lines 10-24 and column 7, line 66 – column 8, line 4) It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the teaching of Nagayasu et al. into the circuit disclosed by the admitted prior art in Figure 10 of the present invention in view of Blasiak et al. and Nagayasu in order to further improve the bit error performance of the receiver.

9. With regard to claims 4 and 6, the description corresponding to the admitted prior art in Figure 2 discloses that the bit corresponding to the differential phase of a first state having a minimum survival path metric is the hard decision data. (See page 7, lines 12-20). Although Watanabe et al. does not explicitly define each survival path metric as recited in claim 2, lines 5-8, it is implicit/inherent that the process of Viterbi decoding involves the selection of a survival path and the corresponding path metric

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while discarding the less likely paths. Therefore, the admitted prior art in view of Blasiak et al., Herzberg, Watanabe et al. and Nagayasu et al. disclose the claimed invention.

10. Claims 8, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakoda et al. (US Patent No. 6,574,283 B1 cited in the Office Action mailed March 3, 2004, Paper No. 3) in view of the admitted prior art in Figure 10 in the present application, Blasiak et al., Herzberg and Watanabe et al. Figures 2a and 3a of Sakoda et al. disclose the claimed invention except for a receiver having a multiple differential phase detected signal output unit and a soft decision demodulated data estimating unit. (See column 1, line 48 – column 3, line 30)

As explained in the rejection of claims 1 and 7 above, the combination of the admitted prior art in Figure 10 in the present application, Blasiak et al., Herzberg and Watanabe et al. discloses the recited multiple differential phase detected signal output unit and the soft decision demodulated data estimating unit. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the circuit disclosed by the combination of the admitted art in Figure 10 in the present application, Blasiak et al., Herzberg and Watanabe et al. in the DQPSK demodulation circuit (13) of Sakoda et al. in order to improve the bit error rate performance of the DQPSK system by using soft decision demodulation.

11. Claims 10, 12 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakoda et al. in view of the admitted prior art in Figure 10 in the

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present application, Blasiak et al., Herzberg, Watanabe et al. and Nagayasu et al.

Figures 2a and 3a of Sakoda et al. disclose the claimed invention except for a receiver having a multiple differential phase detected signal output unit and the soft decision demodulated data estimating unit wherein the soft decision demodulated data estimating unit that estimates soft decision demodulated data based on a survival path metric, a power detection unit, a p-multiplying unit, and a decoding unit for decoding based on the soft decision demodulated data. (See column 1, line 48 – column 3, line 30)

As explained in the rejection of claims 3 and 5 above, the combination of the admitted prior art in Figure 10 in the present application, Blasiak et al., Herzberg, Watanabe et al. and Nagayasu et al. discloses the recited multiple differential phase detected signal output unit and the soft decision demodulated data estimating unit wherein the soft decision demodulated data estimating unit that estimates soft decision demodulated data based on a survival path metric, a power detection unit, a p-multiplying unit, and a decoding unit for decoding based on the soft decision demodulated data. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the circuit disclosed by the combination of the admitted art in Figure 10 in the present application, Blasiak et al., Herzberg, Watanabe et al. and Nagayasu et al. in the DQPSK demodulation circuit (13) of Sakoda et al. in order to improve the bit error rate performance of the DQPSK system by using soft decision demodulation.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Betsy L. Deppe whose telephone number is (571) 272-3054. The examiner can normally be reached on Monday, Tuesday and Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on (571) 272 - 2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Betsy L. Deppe
Primary Examiner
Art Unit 2637